

REMARKS

The non-final Office Action mailed May 21, 2002 and the references cited therein have been carefully considered. Claims 1, 3, 6, 8, 12, and 13 have been amended and Claims 14-20 have been added in a sincere effort to further clarify that which Applicants regard as the invention.

Support for this Amendment is found generally within the specification, claims, and drawings, as originally filed. As a result of this Amendment taken together with the remarks set forth below, it is respectfully submitted that pending Claims 1-20 are now before the Examiner in condition for favorable consideration and allowance.

In the Office Action, the Abstract was objected to as not appearing on a separate sheet. Accordingly, the Abstract is submitted herewith on a separate sheet. Therefore, it is respectfully submitted that the objection to the specification under 37 C.F.R. §1.72(b) has been obviated.

Claims 1-13 have been rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,073,920 to Masukawa et al. (*Masukawa*) in view of U.S. Patent No. 5,465,287 to Egozi (*Egozi*). Specifically, the Examiner indicates that *Masukawa* teaches a method and apparatus for measuring line characteristics and parameters associated with a subscriber telephone line by applying first and second test signals to the lines and then measuring the response in conjunction with the test signals, as shown in Figure 3. Although the Examiner concedes that *Masukawa* fails to teach testing with voltage signals at difference frequencies, the Examiner indicates that *Egozi* teaches a subscriber line impedance measurement device wherein multi-frequency test signals are injected into a subscriber line to computer the line impedance.

The subject invention is directed to a method and apparatus for testing a telecommunications system by applying a first AC test signal having a first signal frequency to the system and measuring the response of the system to the first test signal, and applying a

second AC test signal having a second signal frequency different to the first signal frequency and measuring the response of the system to the second test signal. At least one parameter of the system is calculated from the measured responses, as now defined by amended Claims 1 and 12.

The subject invention is also directed to a method and apparatus for testing a telecommunications system by applying a first test signal to a first line and measuring the response of first and second lines to the first test signal, and applying a second test signal to the second line and measuring the response of the second and first lines to the second test signal. At least one parameter of the telecommunications system is then calculated from the measured responses, as now defined by amended Claims 8 and 13.

Masukawa relates to a subscriber line measuring apparatus and method that charges the line capacitance of a subscriber line using a predetermined current. However, *Masukawa* applies a test signal to both lines A and B simultaneously, as described at column 4, lines 59-63. Thus, this is equivalent to the conventional approach to testing telecommunication systems disclosed at page 2, lines 21-35 of the specification.

In contrast, the subject invention applies a first test signal to the first line, measures a response, and then applies a second test signal to the second line, as defined by Claims 1, 8, 12, and 13. In addition, as the Examiner concedes, *Masukawa* does not teach or suggest the application of two signals having different frequencies and calculating at least one parameter of the system based on the response of the system to these signals, as defined by Claims 1 and 12.

Egozi relates to a device and method for measuring line impedance using test signal waveforms in a signal injection technique that analyzes acquired line test response data. However, there is no teaching or suggestion in either *Masukawa* or *Egozi* to combine these references in the manner suggerter and it is respectfully submitted that improper hindsight would be used in doing so.

Further, even if the disclosure of *Egozi* were combined with that of *Masukawa*, the claimed method and apparatus would not be disclosed. Specifically, *Egozi* does not teach or suggest the use of two test signals, as defined by Claims 8 and 13, or the use of two test signals having different frequencies, as defined by Claims 1 and 12. Rather, as shown in Figure 5, *Egozi* describes the injection of one test signal in steps 30 and 32 followed by impedance calculation using different frequency values in steps 36-40.

For instance, *Egozi* specifically states at column 5, lines 43-46 that after "using the transform or the mathematical filter as applied to the first frequency chosen, the process can be repeated at a different frequency, e.g. w_1 , without requiring additional voltage measurements". It is also indicated that "measurement is obtained at one frequency" at column 5, lines 50-54.

Further, as described at column 6, lines 32-36, "if additional computation is required at a different frequency, control is transferred to block 42, for selection of a new frequency, and the filtering and computation steps are repeated, respectively, in blocks 36-38". In addition, *Egozi* explicitly states that the impedance measurement is derived from a "single set of voltage measurements" at column 6, lines 41-47. In contrast, the subject invention requires two test signals and two measurements, as defined by Claims 1, 8, 12, and 13.

Applicants respectively note that in order to support a claim of *prima facie* obviousness, the cited references must teach or suggest each and every element of the invention, and there must be a motivation in the references or the prior art to combine the references and the prior art as suggested. However, nothing in the art of record would teach or suggest, either alone or in combination, a method and apparatus for testing a telecommunications system by applying a first AC test signal having a first signal frequency to the system and measuring the response of the system to the first test signal, and applying a second AC test signal having a second signal frequency different to the first signal frequency and measuring the response of the system to the second test signal, as now defined by amended Claims 1 and 12. Further, nothing in the art of record would teach or suggest a

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method and apparatus for testing a telecommunications system by applying a first test signal to a first line and measuring the response of first and second lines to the first test signal, and applying a second test signal to the second line and measuring the response of the second and first lines to the second test signal, as now defined by amended Claims 8 and 13.

Applicants respectfully submit that Claims 2-7 and 9-11, which ultimately depend from Claims 1 and 8, respectively, are patentable over the art of record by virtue of their dependency from Claims 1 and 8, respectively. Further, Applicants submit that Claims 2-7 and 9-11 define additional patentable subject matter in their own right. Therefore, it is respectfully requested that the rejection of Claims 1-13 under 35 U.S.C. §103(a) be reconsidered and withdrawn.

In view of the foregoing Amendment and remarks, entry of the amendments to Claims 1, 3, 6, 8, 12, and 13; favorable consideration of Claims 1, 3, 6, 8, 12, and 13, as amended; favorable reconsideration of Claims 2, 4, 5, 7, and 9-11; and allowance of pending Claims 1-20 are respectfully and earnestly solicited.

Respectfully submitted,



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VERSION OF AMENDMENT WITH MARKS
TO SHOW CHANGES MADE

IN THE CLAIMS:

Please amend Claims 1, 3, 6, 8, 12, and 13 by rewriting the same as follows:

1. (Amended) A method of testing a telecommunications system, the method comprising:
 - 1) applying a first AC test signal having a first signal frequency to the system and measuring the response of the system to the first test signal;
 - 2) applying a second AC test signal having a second signal frequency different to the first signal frequency to the system and measuring the response of the system to the second test signal; and
 - 3) calculating [one or more parameters] at least one parameter of the system from the responses measured in steps 1) and 2).
3. (Amended) A method according to claim 1 wherein [one or both] at least one of the test signals has a substantially sinusoidal waveform.
6. (Amended) A method according to claim 1 further comprising [applying];
 - 4) applying [one or more] at least one additional test [signals] signal to the system and measuring the response of the system to at least one test signal; andwherein step 3) comprises calculating [one or more parameters] at least one parameter of the system from the responses measured in steps 1), 2) and 4).
8. (Amended) A method of testing a telecommunications system comprising first and second transmission lines, the method comprising

1) applying a first test signal to the first line and measuring the response of the first line and the second line to the first test signal;

2) applying a second test signal to the second line and measuring the response of the second line and the first line to the second test signal; and

3) calculating [one or more parameters] at least one parameter of the telecommunications system from the responses measured in steps 1) and 2).

12. (Amended) Apparatus for testing a telecommunications system, the apparatus comprising;

1) means for applying a first AC test signal having a first signal frequency to the system;

2) means for measuring the response of the system to the first test signal;

3) means for applying a second AC test signal having a second signal frequency different to the first signal frequency to the system;

4) means for measuring the response of the system to the second test signal; and

5) means for calculating [one or more parameters] at least one parameter of the system from the responses measured in steps 1) and 2).

13. Apparatus for testing a telecommunications system comprising first and second transmission lines, the apparatus comprising:

1) means for applying a first test signal to the first line;

2) means for measuring the response of the first line and the second line to the first test signal;

3) means for applying a second test signal to the second line;

4) means for measuring the response of the second line and the first line to the second test signal; and

5) means for calculating [one or more parameters] at least one parameter of the telecommunications system from the responses measured in steps 1) and 2).

Please add the following new Claims 14-20:

--14. A line model for testing telecommunications systems, the model comprising:

- a) line parameters including at least one of leakage and capacitance between lines and line to earth;
- b) at least one of series line resistance and conductance; and
- c) termination device parameters.

15. A method according to Claim 14, wherein the model is used to test telecommunications systems, the method comprising the steps of:

solving the model symbolically based on multi-frequency measurements from a test end only;

using the line model to determine line parameters, including at least one of series resistance and conductance;

calculating high frequency parameters including insertion loss based on a low frequency line model; and

separating line parameters from termination parameters to determine a termination device based on single end measurements.

16. A method according to Claim 15, further comprising the step of using at least one of the model parameters and high frequency parameters to at least one of test and qualify the digital service capabilities of the line for at least one of ISDN and xDSL.

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17. A method according to Claim 16, further comprising the step of testing and qualifying the digital services from low frequency measurements through a low pass filter including a splitter.

18. A method according to Claim 15, further comprising the step of detecting line contact faults using series resistance parameters.

19. A method according to Claim 15, further comprising the step of detecting loading coils using inductance parameters.

20. A method according to Claim 15, further comprising the step of detecting bridge taps by comparing series parameters with shunt parameters.--